APPENDIX 12A. MANUFACTURER IMPACT ANALYSIS INTERVIEW GUIDE

Fluorescent Lamp Ballasts Rulemaking
Manufacturer Analysis Interview Guide

October 23, 2008

PART 1. MARKET, TECHNOLOGY, AND ENGINEERING ANALYSIS

A. Market Data

This section addresses information on the distribution of fluorescent lamp ballast by efficiency and ballast type. At the framework meeting, DOE said that it would consider covering those ballasts that operate lamps covered in the lamps rulemaking while maintaining current exemptions (i.e, low power factor residential ballasts, cold temperature F96HO ballasts used in outdoor signs, and dimming ballasts). The following lists those ballasts that cover those lamps proposed for coverage in the lamps ANOPR.

- 1-lamp, 2-lamp, 3-lamp, and 4-lamp ballasts that operate 4-foot linear and 2-foot U-shaped medium bipin T8 and T12 lamps (e.g., F40T12, F34T12, F32T8, F30T8, F28T8, F25T8)
- 1-lamp and 2-lamp ballasts that operate 8-foot single pin slimline T8 and T12 lamps (e.g., F96T12, F96T12/ES, F96T8, F96T8/ES)
- 1-lamp and 2-lamp ballasts that operate 8-foot recessed double contact high output T8 and T12 lamps (e.g., F96T12HO, F96T12HO/ES, F96T8HO)

DOE received written comments and comments at the public meeting that DOE should cover the following ballast types:

- Low power factor, residential ballasts
- Dimming ballasts for T5, T8, and T12 lamps
- Cold temperature ballasts used in outdoor signs
- Ballasts that operate T5 lamps
- Mini ballasts
- Ballasts for straight and U-shaped lamps ranging in size from two to eight feet and T5 to T12

A.1 DOE seeks comment on the current market share of each of the ballast types listed above (e.g., low power factor, residential ballasts) and how that market share might change in the future.

A.2 DOE seeks comment on whether it is technologically feasible to improve the efficiency of the ballasts mentioned above.

A.3 Are there specific reasons why DOE should or should not cover any of the ballasts listed above? Should DOE consider covering any additional ballasts to those listed above?

DOE is considering analyzing the following ballasts in the engineering analysis:

- 2-lamp and 4-lamp F40T12, F34T12, and F32T8 ballasts
- 2-lamp F96T12, F96T12/ES, and F96T8 ballasts

- 2-lamp F96T12HO, F96T12HO/ES, and F96T8HO ballasts

A.4 DOE seeks comment on whether these are the most appropriate fluorescent lamp ballasts to study in detail.

A.5 For the ballasts identified, DOE seeks comment on the most common ballast sold in each of the ballast categories. Please describe ballast attributes (i.e., electronic/magnetic, starting method, ballast factor, input power, THD, power factor)

In order to calculate the aggregate national energy savings, DOE would need data on shipment trends. For each of the ballast types, DOE is interested in obtaining shipment data by number of lamps operated and ballast efficiency. DOE is also interested in understanding general market dynamics.

A.6 For each ballast type considered for coverage (e.g., for F32T8 ballasts, F40T12 ballasts, or F96T12 ballasts), what is the proportion of ballasts shipped that operate 1-lamp, 2-lamp, 3-lamp, and 4-lamps? Do you expect these proportions to change overtime? If so, how?

A.7 For electronic F32T8 and F96T8 ballasts, what is the proportion of ballasts shipped that are high efficiency versus standard efficiency? Absent new energy conservation standards, do you expect these proportions to change overtime? If so, how?

A.8 For F32T8 ballasts, what is the proportion of ballasts shipped that are programmed start versus instant start? Absent new energy conservation standards, do you expect these proportions to change overtime? If so, how?

A.9 For F96T12HO and F96T12HO/ES ballasts, what proportion of ballasts shipped are magnetic versus electronic? Absent new energy conservation standards, do you expect these proportions to change overtime? If so, how?

A.10 For F32T8 ballasts, what proportion of ballasts shipped are magnetic versus electronic? Absent new energy conservation standards, do you expect these proportions to change overtime? If so, how?

A.11 What are general trends you see in the market? Absent new energy conservation standards, do you foresee other technologies (e.g., HID or LED) increasing in market share over the next thirty-five years? If so, how?

A.12 What proportion of ballasts shipped are sold in the new renovation market, the replacement market, the early retrofit market, and the new construction market?

B. Engineering Analysis

DOE would like to understand the incremental costs of reducing ballast energy consumption by understanding the design options involved in efficiency improvements. Please describe the discrete design steps you would undertake to achieve the ballasts in the tables below. In each case, start with a standard efficiency ballast, and list the necessary design changes[1] to enable it to become more efficient. For each design change, please also provide an estimate of your incremental production cost over the baseline, as well as the total unit selling price to an OEM or distributor. If additional rows are needed to describe all the design changes you would make, please feel free to modify the tables.

The column labeled "Incr. Cost (over Std. Ballast) per Imp." represents the cost of the specific improvement described. The column labeled "Total Mfr. Unit Selling Price to OEM Fixture Mfr" is your final selling price to your OEM fixture manufacturer. The column labeled "Total Mfr. Unit Selling Price to Comm. or Ind. Sect." is your final selling price to a distributor or contractor in the commercial or industrial sector.

We recognize that detailed designs may be difficult to prepare; therefore, in the interests of generating reasonable results in a short space of time, we invite you to use your best judgment and experience when completing the following tables.

[1] Design changes could include using capacitors with low effective series resistance, diodes with low forward voltage drop or low conduction losses, low loss magnetic materials, or low loss DC to AC circuit topologies.

Table 1 Engineering Analysis for Electronic Instant Start 2-lamp F32T8 Ballasts

#	Ballast Type	Input Power, Ballast Factor	Defining Design Characteristics	Mfr. Production Cost	Total Mfr. Unit Selling Price to OEM Fixture Mfr.	Total Mfr. Unit Selling Price to Comm. or Ind. Sect.
0	Standard Instant Start 2-Lamp F32T8 Ballasts					

#	Ballast Type	Input Power, Ballast Factor	Improvements over Standard Ballast	Incr. Cost (over Std. Ballast) per Imp.	Total Mfr. Unit Selling Price to OEM Fixture Mfr.	Total Mfr. Unit Selling Price to Comm. or Ind. Sect.
1	High Efficiency Instant Start, 2-Lamp F32T8 Ballasts					
2	Maximum Technologically Feasible Instant Start 2-Lamp, F32T8 Ballasts					

Table 2 Engineering Analysis for Electronic Programmed Start 2-lamp F32T8 Ballasts

#	Ballast Type	Input Power, Ballast Factor	Defining Design Characteristics	Mfr. Production Cost	Total Mfr. Unit Selling Price to OEM Fixture Mfr.	Total Mfr. Unit Selling Price to Comm. or Ind. Sect.
0	Standard Programmed 2-Lamp F32T8 Ballast					

#	Ballast Type	Input Power, Ballast Factor	Improvements over Standard Ballast	Incr. Cost (over Std. Ballast) per Imp.	Total Mfr. Unit Selling Price to OEM Fixture Mfr.	Total Mfr. Unit Selling Price to Comm. or Ind. Sect.
1	High Efficiency Programmed Star, 2-Lamp F32T8 Ballast					
2	Maximum Technologically Feasible, Programmed Start 2-Lamp F32T8 Ballast					

D.1 For 2-lamp F40T12 or F34T12 electronic ballasts, what are the defining design characteristics and the total manufacturing selling price? Can the efficiency for these commercially available ballasts be improved? If so, what improvements can be made and how would this impact the power consumed, the cost to manufacture the ballast, and the selling price?

D.2 How would the answers given in Table 1 and Table 2 change for fluorescent lamp ballasts operating 4-lamps?

Table 3 Engineering Analysis for Electronic Instant Start 2-lamp F96T8 Ballasts

#	Ballast Type	Input Power, Ballast Factor	Defining Design Characteristics	Mfr. Production Cost	Total Mfr. Unit Selling Price to OEM Fixture Mfr.	Total Mfr. Unit Selling Price to Comm. or Ind. Dist.
0	Standard, Instant Start 2-Lamp F96T8 Ballast					

#	Ballast Type	Input Power, Ballast Factor	Improvements over Standard Ballast	Incr. Cost (over Std. Ballast) per Imp.	Total Mfr. Unit Selling Price to OEM Fixture Mfr.	Total Mfr. Unit Selling Price to Comm. or Ind. Sect.
1	High Efficiency, Instant Start 2-Lamp F96T8 Ballast					
2	Maximum Technologically Feasible 2-Lamp F96T8 Ballast					

D.3 For 2-lamp F96T12 or F96T12/ES electronic ballasts, what are the defining design characteristics and the total manufacturing selling price? Can the efficiency for these commercially available ballasts be improved? If so, what improvements can be made and how would this impact the power consumed, the cost to manufacture the ballast, and the selling price?

Table 4 Engineering Analysis for 2-lamp F96T12HO Ballasts

#	Ballast Type	Input Power, Ballast Factor	Defining Design Characteristics	Mfr. Production Cost	Total Mfr. Unit Selling Price to OEM Fixture Mfr.	Total Mfr. Unit Selling Price to Comm. or Ind. Sect.
0	Magnetic, Rapid Start 2-Lamp F96T12HO Ballast					

#	Ballast Type	Input Power, Ballast Factor	Improvements over Standard Ballast	Incr. Cost (over Std. Ballast) per Imp.	Total Mfr. Unit Selling Price to OEM Fixture Mfr.	Total Mfr. Unit Selling Price to Comm. or Ind. Sect.
1	Electronic, Rapid Start 2-Lamp F96T12HO Ballast					
2	Maximum Technologically Feasible 2-Lamp F96T12HO Ballast					

D.4 For 2-lamp electronic F96T8HO ballasts, what are the defining design characteristics and the total manufacturing selling price? Can the efficiency for these commercially available ballasts be improved? If so, what improvements can be made and how would this impact the power consumed, the cost to manufacture the ballast, and the manufacturer selling price?

D.5 If there are additional ballasts you feel DOE should cover, what are defining design characteristics and total manufacturer selling price? Can the efficiency of these ballasts be improved? If so, what improvements can be made and how would this impact the power consumed, the cost to manufacture the ballast, and the manufacturer selling price?

D.6 How do you apply markups to your production costs in order to arrive at an OEM and distributor selling price?

C. Distribution Channels, Lifetime and Operating Hours

DOE will need to develop a distribution chain model to understand how ballasts migrate through the market from manufacturer to end-user. DOE is interested in understanding both the proportion (volume) of products that move through certain channels and the mark-ups applied. The following figure displays the distribution chain provided by NEMA in the 2000 Ballast Rule. According a comment provided by NEMA in the 2000 Ballast Rulemaking, 63% of ballasts moved through channel A while 37% moved through channels B and C. DOE also assumed that a 13% contractor markup was applied from the Contractor/LMC to the End User of the Lighting System.

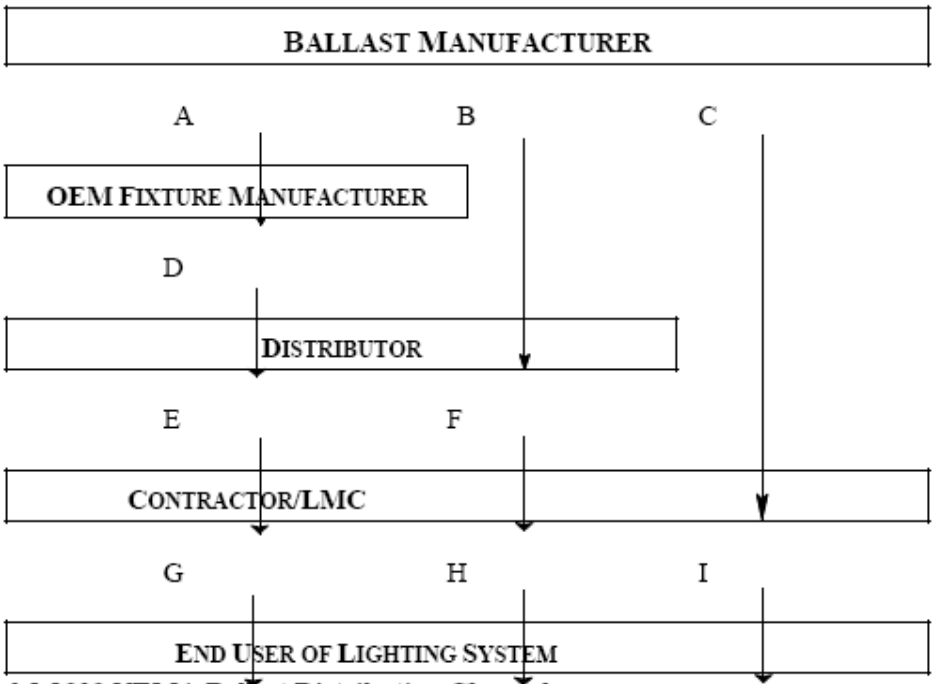

Figure 1: 1999 NEMA Ballast Distribution Channels

C.1 Is the distribution chain displayed in Figure 1 an accurate representation of how ballasts reach the end user? If so, what proportion of shipments move through the various channels (e.g., A, B, or C), and what are the typical mark-ups applied by organizations or individuals in those channels (e.g., mark up applied by the OEM Fixture Manufacturer to the Distributor)? Do your answers vary on the sector of the end-user of the lighting system? If so, how? Assumptions used in the 2000 Ballast rulemaking for some of these estimates are provided above.

C.2 DOE is intending to consider fluorescent lamp ballasts operating in different sectors. For the fluorescent lamp ballasts under consideration in this rulemaking, can you provide an estimate of the proportion of fluorescent lamp ballasts sold into the commercial, industrial, and residential sectors? What proportion of ballast shipments to the residential sector are low power factor, residential ballasts versus high power factor ballasts?

According to our analysis using EIA data and data from the U.S. Lighting Market Characterization, Volume I (DOE, 2002), the average annual operating hours for GSFL is 3,435 hours for the commercial sector, 4,795 hours for the industrial sector and 789 hours for the residential sector.

C.3 Are these reasonable estimates? If not, what is the average annual operating hours by sector? Does the average annual operating hours vary significantly by fluorescent lamp ballast type?

In the fluorescent lamp ANOPR analysis, DOE assumed that the most common T8 lamp operating on an instant start electronic ballast had a lifetime of 20,000 hours at 3 hours on 20 minutes off.

C.4 What would the lamp lifetime be when operating on a programmed start electronic ballast at 3 hours on 20 minutes off? at 1 hour on, 15 minutes off?

In the fluorescent lamp ANOPR analysis and in the 2000 Ballast Rule, DOE assumed that lifetime of a ballast was approximately 50,000 hours. Using average operating hours in the commercial sector, industrial, and residential sector, one calculates a ballast life of approximately 15 years, 10 years, or 63 years respectively.

C.5 DOE understands ballasts are sometimes replaced before they fail due to lighting retrofits or renovations. On average, how often are ballasts replaced in each sector (i.e, what is their average useful lifetime)? Does this lifetime vary by starting method, efficiency, or ballast type?

C.6 What is the average fixture lifetime in each sector? In general, why are fixtures replaced (e.g., fixture “failure”, renovation, or ballast failure)?

D. Test Procedure and Energy Conservation Standards

At the framework meeting, NEMA recommended that DOE may want to change the energy conservation standard metric from ballast efficacy factor (BEF) to ballast efficiency in part because of the inherent variance of the BEF measurement due to the use of fluorescent lamps.

Unfortunately, DOE may not be able to legally change the metric from BEF but it can change the test procedure to measure BEF. One way to accomplish this is to use resistors instead of lamps to determine the ballast factor and input power of a ballast. In order for DOE to determine whether or not to change the test procedure for ballasts, it must understand whether the new test procedure would improve upon the old test procedure.

D.7 For each of the ballasts described above, what is the variability in input power and ballast factor for any given ballast under the current test procedure?

D.8 For the F30T8, F28T8, F25T8, and F96T8/ES there are no ANSI standards specifying which lamp to use when testing a ballast. What are the qualities of the lamps you use to test ballast factor and input power for these ballasts? These qualities will help DOE establish a new test procedure measuring ballast efficacy factor using resistors.

In the framework document, DOE proposed that it may establish product classes for fluorescent lamp ballasts regardless of lamp wattage or lamp diameter. To account for the variance in BEF by lamp wattage, DOE could develop an equation from which manufacturers would calculate the minimum BEF energy conservation standard based on the fluorescent lamps' wattage.

D.9 Can you describe how ballast efficacy factor varies by lamp wattage for the following fluorescent lamp ballasts?

- 4-lamp and 2-lamp ballasts that operate 4-foot linear and 2-foot U-shaped medium bipin lamps
- 2-lamp ballasts that operate 8-foot single pin slimline lamps
- 2-lamp ballasts that operate 8-foot recessed double contact high output lamps

The Team is considering extrapolating energy conservation standards from the analyzed fluorescent lamp ballasts to other product classes.

D.10 Can you describe how this extrapolation might be applied to the following fluorescent lamp ballasts?

- From 4-lamp ballasts to 3-lamp ballasts that operate 4-foot linear and 2-foot U-shaped medium bipin T8 and T12 lamps
- From 2-lamp ballasts to 1-lamp ballasts that operate 4-foot linear and 2-foot U-shaped medium bipin T8 and T12 lamps
- From 2-lamp ballasts to 1-lamp ballasts that operate 8-foot single pin slimline T8 and T12 lamps
- From 2-lamp ballasts to 1-lamp ballasts that operate 8-foot recessed double contact high output T8 and T12 lamps

PART 2. PRELIMINARY MANUFACTURER IMPACT ANALYSIS TOPICS

1 Key Issues

1.1 What are the key issues for your company regarding this fluorescent lamp ballast rulemaking?

1.2 Are there any patent, technology, or other issues that you are aware of that would prevent your company or competitors from implementing higher-efficiency designs?

2 Shipment Projections

2.1 What is your company's approximate market share for the fluorescent lamp ballasts DOE is considering covering?

2.2 Would you expect your market share to change once standards become effective? Does your outlook change with higher efficiency levels?

2.3 How would you expect shipments to change for the industry as a whole as a function of standards and why?

2.4 Looking at price/cost effects only, how would you expect shipments to change for a 25%, 50%, 100% or 200% manufacturer price/cost increase?

3 Conversion Costs

3.1 What level of capital expenditure and product conversion costs would you anticipate to make at higher standard levels? Please describe what they are and provide your best estimate of their respective magnitudes.

3.2 How would the imposition of new energy conservation standards affect capacity, utilization and manufacturing assets at your domestic production facilities? Would a new standard result in stranded capital assets? Would any facilities be closed or downsized? Added or upgraded?

3.3 How might a new standard impact product innovation?

4 Product Mix and Profitability

4.1 How would your company's product mix and marketing strategy change with changes in the efficiency standard?

4.2 Generally how would new product standards impact your customer mix, distribution channels, and corresponding profit margins?

4.3 What is the approximate percentage of shipments (i.e., market share) for each ballast type?

4.4 Do you enjoy consistent profitability across all fluorescent lamp ballast types?

5 Market Shares and Industry Consolidation

5.1 In the absence of new standards, do you expect any industry consolidation?

5.2 How would new standards affect your ability to compete?

5.3 Could new standards disproportionately advance or harm the competitive positions of some firms?

5.4 Are there concerns over intellectual property?

5.5 Could new standards result in disproportionate economic or performance penalties for particular consumer/user subgroups?

5.6 Beyond price and energy efficiency, could new standards result in products that will be more or less desirable to consumers due to changes in product functionality, utility, or other features?

6 Cumulative Regulatory Burden

6.1 Are there recent or impending regulations on your specific product or other products that impose a cumulative burden on the industry?

6.2 If so, what is the total expected impact of those other regulations?